PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference O.Z. 6294-WO	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/EP2004/052608	International filing date *(day/month/year)* 21.10.2004	Priority date *(day/month/year)* 19.12.2003
International Patent Classification (IPC) or national classification and IPC C07F7/08		
Applicant DEGUSSA AG et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 3 sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
27.04.2005	24.10.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Richter, H Telephone No. +49 89 2399-8539

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/052608

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

   Description, Pages

   1-10 as originally filed

   Claims, Numbers

   1-18 received on 29.09.2005 with letter of 28.09.2005

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-18
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-18
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-18
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following document/s/:

D1 : US 4 089 882 A (TAKAMIZAWA MINORU ET AL) 16 May 1978 (1978-05-16)

2 INDEPENDENT CLAIM 1

2.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1 and shows (the references in parentheses applying to this document) a process for the preparation of silicon compounds in which methyldichlorosilane and a binary Pt containing catalyst are charged in an autoclave, heated and the fluoroolefin is metered in (examples 1-7).

The process of claim 1 differs from this known process in the presence of an inert solvent toluene or xylene and in the isolation of the product.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

2.2 The problem to be solved by the present invention may be regarded as making available a new process for the preparation of silicon compounds.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons: the prior art does not describe or suggest the use of a solvent (toluene or xylene).

3. DEPENDENT CLAIMS 2-18

Claims 2-18 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Re Item VIII

Certain observations on the international application

The backreference of claim 18 is not correct (78).

Claims:

1. A process for preparing a silicon compound bearing at least one fluoroalkyl group by hydrosilylation of a fluoroolefin in the presence of a Pt-containing hydrosilylation catalyst, which comprises
   - initially charging and heating a hydrogenchlorosilane,
   - then metering in the fluoroolefin and reacting the reaction mixture
   - and subsequently isolating the hydrosilylation product, and

   wherein a hydrosilylation catalyst based on hexachloroplatinic acid or Pt(0) complex is used.

2. The process as claimed in claim 1, wherein,
   (i) a hydrogenchlorosilane is initially charged, heated, the hydrosilylation catalyst dissolved in an inert solvent is added and the fluoroolefin is then metered in or
   (ii) a hydrogenchlorosilane is initially charged, heated and a mixture of fluoroolefin, hydrosilylation catalyst and optionally solvent is metered in or
   (iii) a mixture of hydrogenchlorosilane and the hydrosilylation catalyst dissolved in a solvent are initially charged, heated and the fluoroolefin is metered in.

3. The process as claimed in claim 1 or 2, wherein the initially charged hydrogenchlorosilane or the initially charged hydrogenchlorosilane-containing mixture is heated to a temperature in the range from 85 to 120°C.

4. The process as claimed in claim 1 or 2, wherein hydrogenchlorosilane and fluoroolefin are used in a molar ratio of from 3:1 to 0.5:1.

5. The process as claimed in at least one of claims 1 to 4, wherein toluene or xylene is used as inert solvent.

6. The process as claimed in at least one of claims 1 to 5, wherein the catalyst is used in a molar ratio of Pt to hydrogenchlorosilane of from 1:100 000 to 1:100.

7. The process as claimed in at least one of claims 1 to 6, wherein at least one hydrogenchlorosilane of the formula (I)

$$H_{(4-a-b)}SiR_aX_b \quad (I),$$

where the groups R are identical or different and R is a linear, branched or cyclic alkyl group having from 1 to 20 carbon atoms or an aryl group, X is Cl and a = 0, 1, 2 or 3 and b = 0, 1, 2 or 3 and $1 \leq (a+b) \leq 3$,

is used.

8. The process as claimed in any of claims 1 to 7, wherein a fluoroolefin of defined purity is used.

9. The process as claimed in any of claims 1 to 8, wherein a fluoroolefin having an iodine content of less than 150 ppm by weight is used.

10. The process as claimed in any of claims 1 to 9, wherein a fluoroolefin having a diene content of less than 100 ppm by weight is used.

11. The process as claimed in any of claims 1 to 10, wherein a fluoroolefin having a water content of less than 100 ppm by weight is used.

12. The process as claimed in any of claims 1 to 11, wherein at least one fluoroolefin of the formula II

$$R^1Y_mCH=CH_2 \quad (II),$$

where R^1 is a monofluorinated, oligofluorinated or perfluorinated alkyl group having from 1 to 12 carbon atoms or a perfluorinated aryl group, Y is a $-CH_2-$, -O-, $-O-CH_2-$, -S- group and m is 0 or 1,

is used.

13. The process as claimed in any of claims 1 to 12, wherein a fluoroolefin selected from the group consisting of 3,3,3-trifluoro-1-propene, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctene, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-tridecafluorodecene, 1,1,2,2-tetrafluoroethyl allyl ether, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorooctene, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-hencosafluorooctene and 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,-14,14,14-pentacosafluorooctene is used.

14. The process as claimed in any of claims 1 to 13, wherein the fluoroolefin is added to the initially charged hydrogenchlorosilane as set forth in (i) or (ii) or (iii) at a pressure of from 1 to 15 bar abs.

15. The process as claimed in any of claims 1 to 14, wherein the fluoroolefin is metered in at a rate of from 50 to 300 l/h, based on 1 t of chlorosilane.

16. The process as claimed in any of claims 1 to 15, wherein the reaction is carried out at a temperature in the range from 85 to 120°C and a pressure of from 1.5 to 50 bar abs. for a period of from 4 to 20 hours.

17. The process as claimed in any of claims 1 to 16, wherein the hydrosilylation product is isolated from the product mixture by distillation and is subsequently esterified with an alcohol, where the alcohol is used in an excess of from 0.1 to 10% and the alcohol used is denatured with ≤ 1% by weight of methyl ethyl ketone or petroleum ether.

18. The process as claimed in any of claims 1 to 78 carried out batchwise in a stirred tank reactor.